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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the person authentication method which attests a person, and the person authentication device using that person authentication method.

[0002]

[Description of the Prior Art]Conventionally, in the security system etc., the image data about a person's some or the whole is memorized beforehand, and the method of attesting a person using the memorized image data and the image data inputted by the data input means at the time of attestation is known.

[0003]Among these, many researches of the person authentication method which compares the person authentication method using two dimensional data, i.e., the two dimensional data memorized beforehand, and the two dimensional data inputted by two-dimensional data input units, such as a TV camera, at the time of attestation, and attests a person are made.

[0004]However, there are the following problems in the person authentication method using this two dimensional data. That is, a person's face and the body are a three-dimensional object, and there is a problem that the two dimensional data inputted by the two-dimensional data input unit is not in agreement on the size or lighting conditions of direction of the two dimensional data and the face which are memorized beforehand, and the face on a picture in many cases.

[0005]Although it is [ that the disagreement of direction of a face should be corrected as a method of solving this problem ] possible to memorize the two dimensional data of direction of various faces beforehand, the problem that a lot of two dimensional data must be memorized in this case arises. Although it is possible to perform amendment (normalization) which doubles the size of the face on the picture of the memorized two dimensional data and the inputted two dimensional data that the disagreement of the size of the face on a picture should

be corrected, now, the problem that the information of the size of a actual face is missing arises. Although it is [ that the disagreement of lighting conditions should be corrected ] possible to control lighting conditions, now, the problem that the place which can attest a person is limited arises.

[0006]According to the person authentication method which, on the other hand, compares the person authentication method, i.e., the three-dimensional data beforehand memorized as dictionary data, using three-dimensional data directly, and the three-dimensional data inputted by the three-dimensional data input unit, the problem about direction of the above faces is solved. In the person authentication method using this three-dimensional data. For example, perform alignment of the three-dimensional data inputted as dictionary data, and parts, such as a nose and a mouth, are extracted from the method of making a judgment parameter distance between both three-dimensional data, and both three-dimensional data, There are a method of comparing these parts and the method of expressing both three-dimensional data as parameters showing shape, such as curvature, and comparing the parameter.

[0007]However, the person authentication method of a gap to use three-dimensional data for directly also has the problem that it is difficult for a noise to extract a characteristic parameter weakly.

[0008]This invention is made in view of an above-mentioned problem, and it aims at providing the person authentication method and the device which can attest a person simply and correctly.

[0009]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a person authentication method concerning this invention, Memorize beforehand three-dimensional data about a person's some or the whole as dictionary data, and This dictionary data, It is a person authentication method which attests a person using three-dimensional data inputted by a three-dimensional data input means at the time of attestation, A positional attitude of three-dimensional data inputted by said three-dimensional data input means is detected, A two-dimensional picture for attestation of the same positional attitude and a two-dimensional picture for [ attesting ] are mutually generated, respectively from three-dimensional data inputted as said dictionary data based on this detection result, a two-dimensional picture for these attestation is compared with a two-dimensional picture for [ attesting ], and a person is attested.

[0010]According to this method, since each of two-dimensional pictures for attestation to compare and two-dimensional pictures for [ attesting ] is generated by the same positional attitude from three-dimensional data, they can coincide a size and lighting conditions of direction of a face and a face on a picture, respectively. Since all that are called a two-dimensional picture for attestation and a two-dimensional picture for [ attesting ] are two-

dimensional pictures, actually using for comparison, While being able to reduce a noise which had been produced when three-dimensional data was used directly, it is not necessary to extract a characteristic parameter and a person can be attested simply and correctly.

[0011]It is desirable as said two-dimensional picture for attestation, and a two-dimensional picture for [ attesting ] to use a shading image or a texture-mapping picture. According to this, a two-dimensional picture can be easily generated from three-dimensional data by technique of the usual computer graphics, and a person can be attested more simply and correctly.

[0012]On the other hand, this invention is characterized by a person authentication device comprising the following.

A three-dimensional data input means which inputs three-dimensional data about a person's some or the whole.

A memory measure which memorizes beforehand three-dimensional data about a person's some or the whole as dictionary data.

A position posture detection means which detects a positional attitude of three-dimensional data inputted by said three-dimensional data input means.

A two-dimensional picture generation means which generates a two-dimensional picture for attestation of the same positional attitude, and a two-dimensional picture for [ attesting ] mutually from three-dimensional data before inputted as said dictionary data based on a detection result of this position posture detection means, respectively, An image comparing means which compares said two-dimensional picture for attestation with a two-dimensional picture for [ attesting ] mutually, and attests a person.

[0013]According to this device, an above-mentioned person authentication method can be enforced simply and certainly.

[0014]

[Embodiment of the Invention]Hereafter, the embodiment of this invention is described based on a drawing.

[0015]Drawing 1 shows the block diagram of the person authentication device concerning the embodiment of this invention.

[0016]In drawing 1, the three-dimensional data input means 1 can input three-dimensional data provided with the accuracy and resolution of a face required for attestation of a person. The stereo method which carries out the three dimensional recognition of a person's face by taking a photograph with two or more cameras installed in a different place as this three-dimensional data input means 1, for example, To a person's face, project a thin slit image at the angle of about 45 degrees, and observe the image from the direction of regular reflection, or, Or it glares so that the surface of a person's face may be cut by a slit shape thin bundle of rays, Various kinds of things using the optical cutting method which carries out the three

dimensional recognition of a person's face, the moire method which piles up the lattice of two sheets, observes the striped pattern of interference produced by the difference of the interval of this lattice or mutual rotation, and carries out the three dimensional recognition of a person's face, etc. are mentioned by observing from the side the shape of the cutout line produced on that surface. As long as there is three-dimensional data inputted into the three-dimensional data input means 1 with necessity besides three-dimensional formed data, it may contain the two dimensional data matched with formed data.

[0017]The data storage means 2 memorizes beforehand the three-dimensional data of an attestation person's face beforehand inputted by said three-dimensional data input means 1 or other three-dimensional data input means as dictionary data. Since it is good that these attestation person's dictionary data has the same positional attitude respectively, dictionary data, It is desirable to use the jig which fixes an attestation person's head, or to amend and to create the inputted three-dimensional data so that a positional attitude may become respectively fixed by the below-mentioned position posture detection means 3 grade. What is necessary is just to use a hard disk, a magneto-optical disc, etc. as a data storage means.

[0018]The position posture detection means 3 detects the positional attitude of measurement data from the dictionary data beforehand memorized by said data storage means 2 and the three-dimensional data (henceforth measurement data) inputted by the three-dimensional data input means 1 at the time of attestation. For example, it is considered as the method of carrying out presumed detection of the positional attitude only from three-dimensional data, ""UsingSpin Images for Efficient Object Recognition in Cluttered 3D Scenes",IEEE Trans.on PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL.21, and a method as shown in the literature of NO.5-1999" are mentioned. It is considered as the method of carrying out presumed detection of the positional attitude from the three-dimensional model and two dimensional data of a border line, such as eyes, a lip, and a supercilium, In the literature of ""HeadPose Determination from One Image Using a Generic Model",3rd.Intl.conf.on Face&Gesture Recognition,1998." A method as shown is mentioned.

[0019]The two-dimensional picture generation means 4 for attestation and the two-dimensional picture generation means 5 for [ attesting ] generate the two-dimensional picture for attestation of the same positional attitude, and the two-dimensional picture for [ attesting ] mutually from dictionary data and measurement data based on the detection result of said position posture detection means 3, respectively. About generation of the positional attitude of this two-dimensional picture for attestation, and the two-dimensional picture for [ attesting ], based on the detection result of said position posture detection means 3, the observation post posture of a generated image may be doubled with the camera station posture of dictionary data or measurement data, and it may double with both mid-position.

[0020]It is desirable as said two-dimensional picture for attestation, and a two-dimensional

picture for [ attesting ] to use a shading image or a texture-mapping picture. According to this, a two-dimensional picture is easily generable from three-dimensional data by the technique of the usual computer graphics. To use a texture-mapping picture as the two-dimensional picture for attestation, and a two-dimensional picture for [ attesting ], it is required for each point of the three-dimensional data inputted by the three-dimensional data input means 1 and matching between two-dimensional pictures to be possible. For example, what is necessary is just to use the input machine which can input simultaneously the three-dimensional data and two dimensional data like Minolta VIVI700 as a three-dimensional data input means.

[0021]By comparing mutually the two-dimensional picture for attestation generated by the two-dimensional picture generation means 4 for attestation with the two-dimensional picture for [ attesting ] generated by the two-dimensional picture generation means 5 for [ attesting ], the image comparing means 6 attests a person and outputs the authentication result to the monitor of graphic display abbreviation, etc. For example, what is necessary is just to use for this attestation the method shown in articles, such as ""unlock control system by face image collation" IEICE TRANSACTIONS Vol.80 D-II, and pp2203-2208-1997."

[0022]Next, it \*\* about operation of the person authentication device shown in drawing 1.

[0023]First, dictionary data is created beforehand. That is, input the three-dimensional data of an attestation person's face beforehand by the three-dimensional data input means 1, the data storage means 2 is made to memorize as dictionary data, and this operation is repeated by a required attestation person's number.

[0024]Next, after inputting the three-dimensional data of a person's [ to be attested ] face as measurement data by the three-dimensional data input means 1 at the time of attestation, in the position posture detection means 3, the positional attitude of said measurement data to the dictionary data beforehand memorized by said data storage means 2 and measurement data is detected.

[0025]And in the two-dimensional picture generation means 4 for attestation, and the two-dimensional picture generation means 5 for [ attesting ], the two-dimensional picture for attestation of the same positional attitude and the two-dimensional picture for [ attesting ] are mutually generated from dictionary data and measurement data based on the detection result of said position posture detection means 3, respectively.

[0026]And in the image comparing means 6, by comparing mutually the two-dimensional picture for attestation generated by the two-dimensional picture generation means 4 for attestation with the two-dimensional picture for [ attesting ] generated by the two-dimensional picture generation means 5 for [ attesting ], a person is attested and the authentication result is outputted to the monitor of graphic display abbreviation, etc.

[0027]Thus, since each of two-dimensional pictures for attestation to compare and two-dimensional pictures for [ attesting ] is generated by the same positional attitude from the

dictionary data and measurement data which are three-dimensional data, they can coincide the size and lighting conditions of direction of a face and the face on a picture, respectively. The two-dimensional picture for attestation and the two-dimensional picture for [ attesting ] which are used for a actual comparison, Since all are two dimensional data, while being able to reduce a noise which had been produced when three-dimensional data was used directly, it is not necessary to extract a characteristic parameter and a person can be attested simply and correctly.

[0028]

[Effect of the Invention] Since a person is attested by [ which compare the two-dimensional picture for attestation of the same positional attitude with the two-dimensional picture for / attesting / mutually ] having been generated from three-dimensional data according to the invention concerning claim 1, While being able to coincide the size and lighting conditions of direction of a face and the face on a picture, respectively, a noise can be reduced, and it is not necessary to extract a characteristic parameter, and a person can be attested simply and correctly.

[0029] According to the invention concerning claim 2, a two-dimensional picture can be easily generated from three-dimensional data by the technique of the usual computer graphics, and a person can be attested more simply and correctly.

[0030] According to the invention concerning claim 3, an above-mentioned person authentication method can be enforced simply and certainly.

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